Fact Sheet VTAHPS 2-1
December 1993

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Respiratory Protection in Agriculture[1]

Dr. Glen H. Hetzel and J. Butler[2]

If you work in any one of these situations and do not wear some form of respiratory protection, then you are placing yourself at risk for serious lung diseases or even death.

You may encounter a range of health problems from minor, temporary discomfort caused by allergic reactions to fatal asphyxiation depending upon the work environment and the hazards presented.

In each of these cases, however, proper respiratory equipment can protect you. Using such equipment is not the only means of protection in all of these cases, but it is a practical solution to safeguard and even improve your health.

WHO NEEDS RESPIRATORY PROTECTION?

- THOSE working in dusty fields and buildings
- THOSE handling moldy hay
- THOSE working in silos
- THOSE feeding or working with feedstuffs
- THOSE working in com silage
- THOSE uncapping silos
- THOSE cleaning grain bins
- THOSE exposed to bird droppings or dust from animal hair or fur.
- THOSE exposed to fish meal
- THOSE applying agricultural chemicals (e.g. fertilizers and pesticides)
- THOSE working with toxic paints or solvents

CHOOSING THE PROPER EQUIPMENT

It is important to wear respiratory equipment when working in a hazardous environment, **but it must be the proper equipment for the specific task**. Here are some things to keep in mind when deciding which equipment to choose:

- Make a list of operations and work sites where there is any kind of contamination.
- List any type of job where a lack of oxygen is a problem.
- List the specific contaminants that correspond to the work site and its jobs.
- List how harmful the contaminants are - both potentially and/or actually.
- List the form of the contaminant material: dust, mist, spray, gas, vapor, fume or some combination of these.
- Give the concentrations of each contaminant.
- Read all labels.

There are several types of protective equipment available for all tasks. They are broken down into two categories:

1. Air Purifying. This type removes contaminants from the air. It is only to be used where there is a sufficient oxygen supply. This category includes: mechanical filter, chemical cartridge and canister gas mask respirators.

2. Oxygen Providing. This type provides oxygen for the user in oxygen-deficient atmospheres. This category includes: supplied-air respirators and Self-Contained Breathing Apparatus (SCBA).

1. This document is Fact Sheet VTAHPS 2-1, a series of the Agricultural Engineering Department, Virginia Polytechnic Institute and State University. This publication was developed with funds from the Center for Disease Control/National Institute for Occupational Safety and Health, Project UOS/CCU 306075-03-1. Publication date: December 1993.

2. Dr. Glen Hetzel and J. Butler, Agricultural Engineering Department, Virginia Tech.

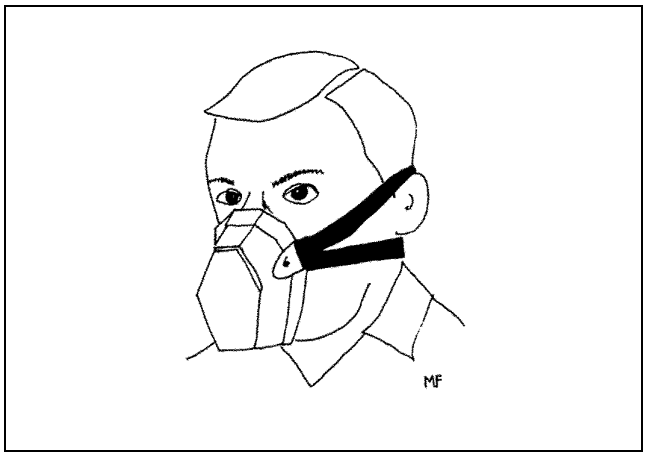

Figure 1.

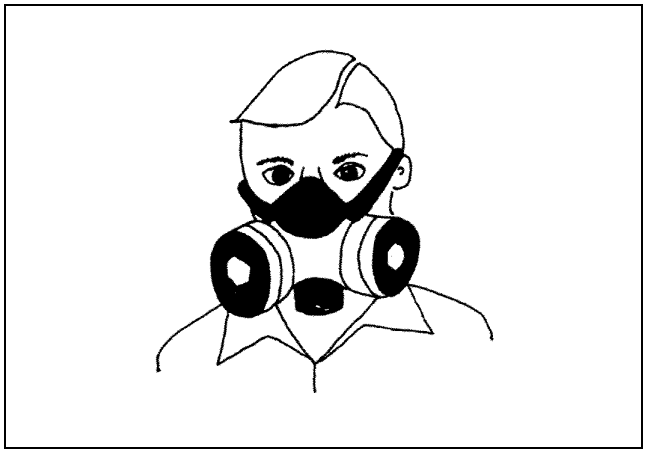

Figure 2.

Air Purifying Respiratory Protection

Mechanical filter respiratory protection devices are commonly known as dust masks. These simple filters commonly consist of a molded filter designed to cover the nose and mouth. The filter is held in place by one or two elastic straps that are stretched over the head. Some of these type masks have a valve made into the filtering substance to allow easier breathing. When the filter becomes clogged, the complete unit is discarded. Units having two straps fit better.

Dust masks provide protection against airborne dust particles (chemical, mineral, field or barn, chaff, pollen) and non-toxic paint spray dusts. Sufficient levels of oxygen must be present in the air to be filtered.

Chemical Cartridge

Chemical cartridge respirators provide a higher level of protection than dust masks. A soft rubber-like face piece (silicone) covers the nose and mouth and contains valves to control air movement through the device. A full face respirator also contains a lens to cover the eyes. Replaceable cartridges containing activated carbon are used to filter the incoming air. Prefilters are usually installed on the outside of the cartridges. Elastic straps or harness are used to hold the respirator snugly against the user's face. A half mask covers only the nose and mouth of the user. A full face respirator also includes an eye shield and covers the entire face and eyes.

The user must anticipate the type of hazard to be protected against and purchase the correct cartridges. Most cartridges are designed to provide protection for a specific type of chemical hazard such as pesticides, ammonia, anhydrous ammonia, etc. Sufficient levels of oxygen must be present in the air to be filtered.

Gas Masks

Gas masks have full face coverage. The filtering cartridge or canister has a larger capacity than a cartridge type respirator. The cartridge may be mounted on the face piece or at the end of a flexible hose to allow mounting at the user's belt. Sufficient levels of oxygen must be present in the air where gas masks are used.

Gas masks provide protection against pesticides, and often toxic erbium materials. The greater capacity of gas mask cartridges (canisters) allows longer working times in high levels of contaminants than typical respirators.

Supplied-Air Respiratory Protection

Supplied-air respirators provide fresh air from a remote source or from pressurized tanks. The face pieces are similar to cartridge type respirators or gas masks. The air may be supplied by a portable air compressor or pressure tanks located up to 300 feet from the user. Compressors must be located in a clean air area.

Supplied-air respirators can be used in confined spaces where there is likely to be an inadequate level of oxygen.

Self-Contained Breathing Apparatus. (SCBA) is a type of respirator that has full face coverage and an oxygen supply contained in a compressed air tank carried on the users back. It can be used in oxygen deficient areas and in hazardous atmospheres.

A self-contained breathing apparatus can be used where ever the user must work, such as in silos, manure pits, grain storage and fumigation of structures.

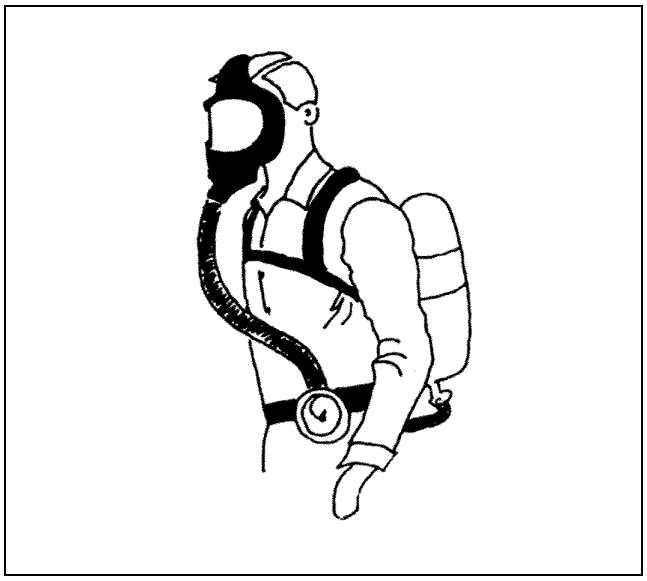

Figure 3.

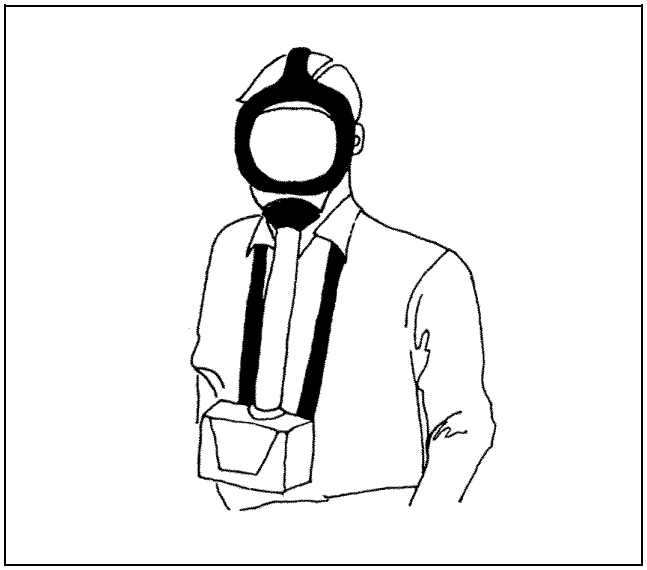

Figure 4.

HAZARDOUS SOURCES AND THEIR CONTAMINANTS

Table 1 identifies some common hazardous sources and their potential contaminants. It briefly summarizes situations where you should use protective equipment to guard against dangerous elements that may be present in the listed work environments - **your** work environment.

PLACES WHERE YOU CAN BUY RESPIRATORY EQUIPMENT

You can probably find most types of equipment at a safety supply store, but farm supply stores and agricultural chemical suppliers are also good sources. If any of these suppliers do not have the equipment you need, they can likely order it for you or tell you how you can order it yourself. Places that test-fit the respiratory device to ensure a proper fit are the best places to purchase your equipment.

For information concerning the selection and use of respiratory equipment, contact local agricultural stores, safety supply stores, pesticide sales outlets, or the Virginia Cooperative Extension.

RESPIRATORY EQUIPMENT SAFETY

Respiratory equipment can safeguard your health and save your life in any hazardous air condition you may encounter. However, without proper care and precautions when using such equipment, the device you rely on could be ineffective. Here is a list of guidelines and precautions every worker should follow when using protective equipment.

- **Individuals should be completely familiar with equipment use, replacement, care, cleaning and storage.** Individuals should be properly trained (SCBA requires special training for use).

- Individuals should test equipment before every use. Follow the manufacturer's instructions for properly testing equipment. If you are using a respirator that has cartridges, you can use one of two methods of testing:

  - Positive Fit Check. Exhale while you cover the exhalation valve with the palm of your hand -- if you feel air against the skin of your face, there is a leak in the seal.

  - Negative Fit Check. Cover the cartridge(s) with your hands and inhale -- if the mask is drawn tightly to your face, there is no leakage.

- **Make sure the equipment properly fits you**. Leakage defeats the effectiveness of even the best respirator for the situation. Testing the equipment will assure a proper fit.

- **Individuals should regularly clean and repair equipment.**

- **Individuals should regularly change filter cartridges and prefilters.**

Table 1.

SILAGE	MANURE PITS	CONFINED POULTRY HOUSING	CONFINED HOG HOUSING	PESTICIDES
· CO_2 · nitrogen oxides · mold spores	· ammonia · methane · CO_2 · hydrogen sulfide	DUSTS: · feathers and feather particles · dried skin material · dried fecal material · dried feed products GASES: · ammonia · CO_2	DUSTS: · hair and skin particles · dried fecal products · dried fecal particles GASES: · ammonia · CO_2 · Hydrogen sulfide · Methane	TOXIC: · fumes · gases · mists · dusts

If you are using filter cartridges and you notice a change in smell or taste or you begin coughing, then the hazardous material may be getting through the filter and it should be changed. You should consider setting a regular changing schedule if the contaminant cannot be noticed by the five senses.

If you are using a pre-filter for more than five or six hours a day, then you should change the filter daily. It is important to change filters cartridges before breathing becomes difficult.

- **Individuals should store protective equipment in a clean, dry place away from work and chemical storage areas**. Self-sealing plastic bags are ideal for storing clean respirators.

- **Individuals must be fully capable of wearing-protective equipment**. If you are not sure or do not know how a condition you may have could affect proper use of equipment, check with your physician. Some conditions which could cause problems are: asthma, allergies, emphysema, high blood pressure, heart disorder, claustrophobia or minor facial abnormalities.

- Buy only certified respirators. Look for labels approved by NIOSH or MSA that show an approval number.

- If it is practical, assign respirators to individuals.

Caution: Often, it is necessary to use other protective equipment and clothing when using respiratory protective equipment, such as special gloves, eye protection, and long sleeve shirts.

IN CASE OF EMERGENCY

If you suddenly feel **sick, dizzy** or **cannot breathe** properly, **leave the hazardous area immediately.**

If someone else is overcome by toxic gases:

1. PROTECT YOURSELF with a proper respirator before entering the hazardous area.

2. Remove the victim to fresh air.

Act **quickly** but **thoughtfully!**

A few minutes without oxygen can cause brain damage or death for the victim - but without thinking about your own safety, you could also become a victim.

Call for help

Rescue Squad: xxx-xxxx
Fire Department: xxx-xxxx
Emergency: 911

Your additional local number: